THE CLAIMS

1. A system for measuring one or more properties of a film comprising:

a light source for directing light to the film;

a one-dimensional imaging spectrometer for receiving light reflected from or transmitted through a one dimensional pattern of spatial locations on the film, and determining therefrom a reflectance or transmission spectrum for one or more of the spatial locations in the pattern;

a translation mechanism for relatively translating the film with respect to the spectrometer; and

a processor for (a) obtaining from the spectrometer reflectance or transmission spectra for a plurality of one dimensional patterns of spatial locations along the film; (b) aggregating these reflectance or transmission spectra to obtain reflectance or transmission spectra for a two dimensional area on the film; and (c) determining therefrom one or more properties of the film.

2. The system of claim 1 wherein the spectrometer is configured to provide resolution of 1 mm or better along both first and second spatial dimensions.

3. The system of claim 1 wherein the reflectance or transmission spectra for the area has spatial resolution of 1 mm or better.

4. The system of claim 1 in which the translation mechanism is configured to move a platform supporting the film relative to the spectrometer or the spectrometer and light source.

5. The system of claim 1 in which the translation mechanism is configured to move the spectrometer or spectrometer and light source relative to a platform supporting the film.

6. The system of claim 1 where the processor is configured to determine the one or more properties of the layer at one or more desired measurement locations.

7. The system of claim 6 wherein the processor is configured to locate the one or more desired measurement locations at least in part by analyzing at least a portion of the reflectance or transmission spectra for the two dimensional area.

8. The system of claim 7 wherein the processor is configured to determine the one or more properties at a location by comparing a modeled reflectance or transmission spectrum with an actual reflectance or transmission spectrum at or within an area surrounding the location.

9. The system of claim 7 wherein the processor is configured to vary one or more modeling assumptions or the location of the actual reflectance or transmission spectrum until the actual reflectance or transmission spectrum and modeled reflectance or transmission spectrum are within a predetermined tolerance.

10. The system of claim 6 wherein the processor is configured to determine film thickness at the one or more desired measurement locations.

11. The system of claim 6 wherein the processor is configured to determine an optical constant at the one or more desired measurement locations.

12. The system of claim 6 wherein the processor is configured to determine doping density at the one or more desired measurement locations.

13. The system of claim 6 wherein the processor is configured to determine a refractive index at the one or more desired measurement locations.

14. The system of claim 6 wherein the processor is configured to determine an extinction coefficient at the one or more desired measurement locations.

15. The system of claim 1 wherein the translation mechanism is integral with equipment for manufacturing semiconductor microelectronics.

16. The system of claim 1 wherein the spectrometer is configured to determine reflectance or transmission spectra for a one dimensional pattern of spatial locations in the shape of a line.

17. The system of claim 16 wherein the line is linear.

18. The system of claim 16 wherein the line is non-linear.

19. The system of claim 16 wherein the reflectance or transmission spectra for the two dimensional area is aggregated from the reflectance or transmission spectra of successive lines.

20. The system of claim 1 wherein the spectrometer is configured to communicate reflectance or transmission spectra to the processor through a wireless interface.

21. The system of claim 1 wherein the spectrometer is configured to communicate reflectance or transmission spectra to the processor through a wireline interface.

22. The system of claim 1 wherein the spectrometer is configured to communicate reflectance or transmission spectra to the processor through one or more optical communications links.

23. The system of claim 1 wherein the one-dimensional imaging spectrometer is configured to receive light reflected from or transmitted through a plurality of one dimensional patterns of spatial locations on the film, and determining for each such pattern a reflectance or transmission spectrum for one or more of the spatial locations in the pattern, the spectrometer configured to provide resolution of 1 mm or better along both first and second spatial dimensions.

24. A method for measuring one or more properties of a film comprising:
directing light to the film;

receiving light reflected from or transmitted through a one dimensional pattern of spatial locations on the film, and determining therefrom a reflectance or transmission spectrum for one or more of the one dimensional spatial locations in the pattern;

obtaining reflectance or transmission spectra for additional one dimensional patterns of spatial locations on the film;

aggregating these reflectance or transmission spectra to obtain reflectance or transmission spectra for a two dimensional area on the film, and

determining therefrom one or more properties of the film.

25. The method of claim 24 wherein the reflectance or transmission spectra for the area has spatial resolution of 1 mm or better.

26. The method of claim 24 further comprising determining the one or more properties of the film at one or more desired measurement locations.

27. The method of claim 26 further comprising locating the one or more desired measurement locations at least in part by analyzing at least a portion of the reflectance or transmission spectra for the two dimensional area.

28. The method of claim 26 further comprising determining the one or more properties at a location by comparing a modeled reflectance or transmission spectrum with an actual reflectance or transmission spectrum at or within an area surrounding the location.

29. The method of claim 28 further comprising varying one or more modeling assumptions or the location of the actual reflectance or transmission spectrum until the actual reflectance or transmission spectrum and modeled reflectance or transmission spectrum are within a predetermined tolerance.

30. The method of claim 24 further comprising determining film thickness at the one or more desired measurement locations.

31. The method of claim 24 further comprising determining an optical constant at the one or more desired measurement locations.

32. The method of claim 24 further comprising determining doping density at the one or more desired measurement locations.

33. The method of claim 24 further comprising determining a refractive index at the one or more desired measurement locations.

34. The method of claim 24 further comprising determining an extinction coefficient at the one or more desired measurement locations.

35. The method of claim 24 further comprising obtaining reflectance or transmission spectra for successive one dimensional patterns of contiguous spatial locations along the film in the shape of a line.

36. The method of claim 35 wherein the line is linear.

37. The method of claim 35 wherein the line is non-linear.

38. The method of claim 35 further comprising aggregating the reflectance or transmission spectra for successive lines to form the reflectance or transmission spectra for the two dimensional area.

39. The method of claim 38 further comprising receiving light reflected from or transmitted through a plurality of one dimensional patterns of spatial locations on the film, and determining for each such pattern a reflectance or transmission spectrum for one or more of the one dimensional spatial locations in the pattern.

40. A system for measuring one or more properties of a film comprising:

means for directing light to the film;

means for receiving light reflected from or transmitted through a one dimensional pattern of spatial locations on the film, and determining therefrom a

reflectance or transmission spectrum for one or more of the spatial locations in the pattern;

means for relatively translating the film with respect to the spectrometer; and

means for (a) obtaining from the spectrometer reflectance or transmission spectra for a plurality of one dimensional patterns of spatial locations along the film; (b) aggregating these reflectance or transmission spectra to obtain reflectance or transmission spectra for a two dimensional area on the film; and (c) determining therefrom one or more properties of the film.

41. A method for measuring one or more properties of a film comprising:

a step for directing light to the film;

a step for receiving light reflected from or transmitted through a one dimensional pattern of spatial locations on the film, and determining therefrom a reflectance or transmission spectrum for one or more of the one dimensional spatial locations in the pattern;

a step for obtaining reflectance or transmission spectra for additional one dimensional patterns of spatial locations on the film;

a step for aggregating these reflectance or transmission spectra to obtain reflectance or transmission spectra for a two dimensional area on the film, and

a step for determining therefrom one or more properties of the film.

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